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Topaz Lake, Douglas County, Nevada, and Mono County, California

U.S. National Eutrophication Survey, Las Vegas, Nev

Prepared for

Environmental Monitoring and Support Lab, Las Vegas, Nev

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NATIONAL EUTROPHICATION SURVEY

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT
ON
TOPAZ LAKE
DOUGLAS COUNTY, NEVADA
MONO COUNTY, CALIFORNIA
EPA REGION IX
WORKING PAPER No. 811

WITH THE COOPERATION OF THE
NEVADA ENVIRONMENTAL PROTECTION SERVICE
AND THE
NEVADA NATIONAL GUARD
SEPTEMBER, 1977

REPORT ON TOPAZ LAKE

DOUGLAS COUNTY, NEVADA

MONO COUNTY, CALIFORNIA

EPA REGION IX

by

National Eutrophication Survey

Water and Land Quality Branch
Monitoring Operations Division
Environmental Monitoring & Support Laboratory
Las Vegas, Nevada

and

Special Studies Branch
Corvallis Environmental Research Laboratory
Corvallis, Oregon

Working Paper No. 811

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U.S. ENVIRONMENTAL PROTECTION AGENCY

September 1977

1a

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by the U.S. Environmental Protection Agency and to augment plans implementation by the States.

ACKNOWLEDGMENTS

The staff of the National Eutrophication Survey (Office of Research and Development, U.S. Environmental Protection Agency) expresses sincere appreciation to the Nevada State Environmental Protection Service, the California State Water Resources Control Board and the California Regional Water Quality Control Board for professional involvement, to the Nevada and California National Guards for conducting the tributary sampling phase of the Survey, and to those Nevada and California wastewater treatment plant operators who provided effluent samples and flow data.

The staff of the Department of Conservation and Natural Resources, Division of Environmental Protection, Nevada Environmental Protection Service, and the staffs of the Division of Planning and Research of the California Water Resources Control Board and the Regional Water Quality Control Board, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports and provided critiques most useful in the preparation of this Working Paper Series.

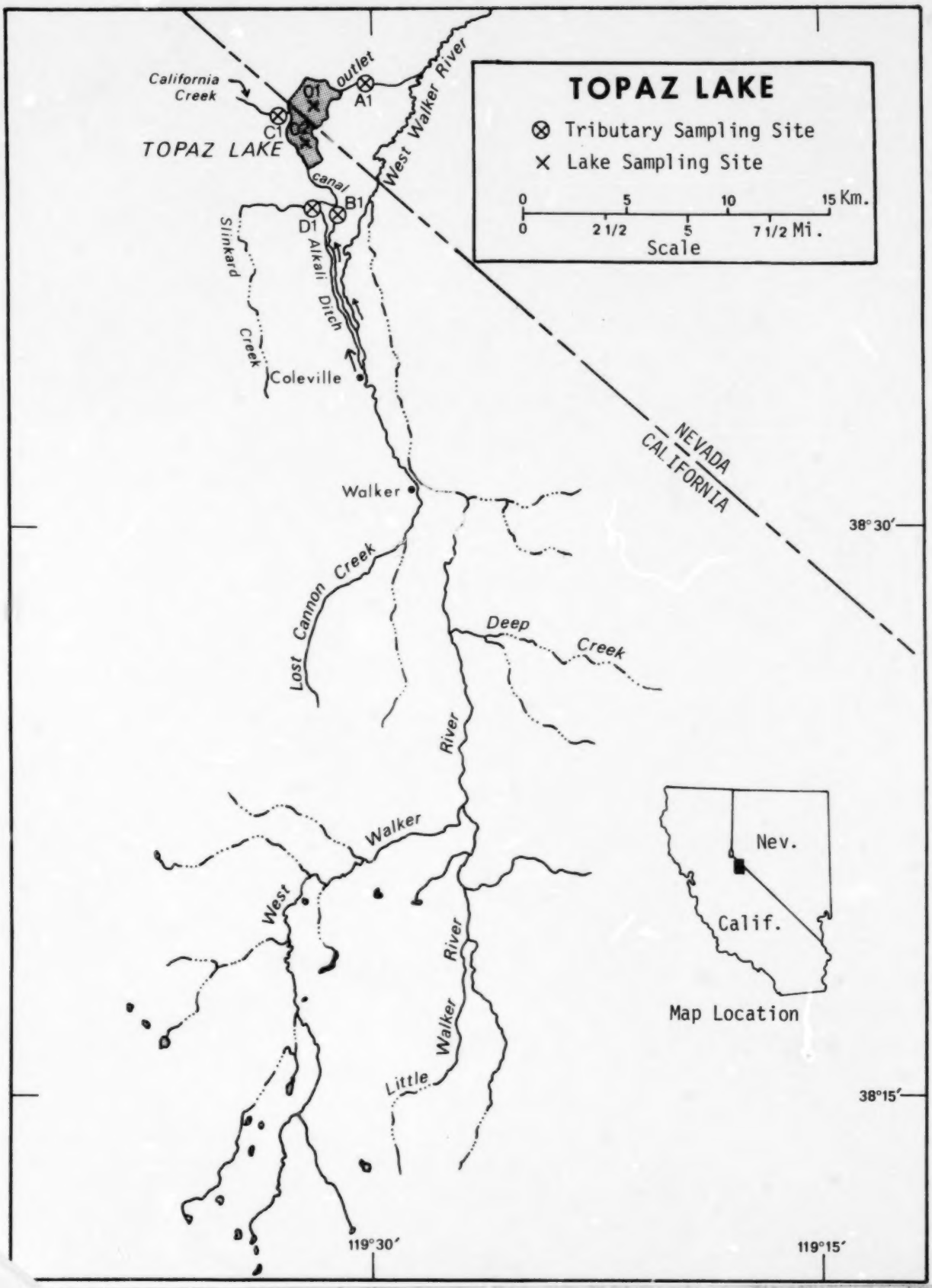
Major General Floyd L. Edsall, the Adjutant General of Nevada, and Project Officer Major Harold E. Roberts, who directed the volunteer efforts of the Nevada National Guardsmen, and Major General Glen C. Ames, the Adjutant General of California, and Project Officer Second Lieutenant Terry L. Barrie, who directed the volunteer efforts of the California National Guardsmen are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF NEVADA

LAKE NAME	COUNTY
Lake Mead	Clark (Mohave in Arizona)
Lahontan Reservoir	Lyon, Churchill
Rye Patch Reservoir	Pershing
Lake Tahoe	Washoe, Carson City, Douglas (Placer, El Dorado in CA)
Topaz Reservoir	Douglas (Mono in CA)
Upper Pahranagat Lake	Lincoln
Washoe Lake	Washoe
Wildhorse Reservoir	Elko
Wilson Reservoir	Elko
Walker Lake	Mineral


TOPAZ LAKE
Tributary Sampling Site
Lake Sampling Site
0 5 10 15 Km.
0 2 1/2 5 7 1/2 Mi.
Scale
California Creek
Outlet
A1
C1
C2
C3
TOPAZ LAKE
Canal
West Walker River
B1
D1
Slinkard Creek
Alkali Ditch
Coleville
NEVADA
CALIFORNIA
Walker
38°30′
Lost Cannon Creek
Deep Creek
River
Walker
West Walker River
Little Walker River
38°15′
119°30′
119°15′
Nev.
Calif.
Map Location

REPORT ON TOPAZ LAKE, NEVADA

STORET NO. 3206

I. CONCLUSIONS

A. Trophic Condition:*

Survey data indicate that Topaz Lake is eutrophic, i.e., nutrient rich and highly productive. Whether such nutrient enrichment is to be considered beneficial or deleterious is determined by its actual or potential impact upon designated beneficial water uses of the lake.

Chlorophyll a values in the lake ranged from 3.2 µg/l in March to 11.1 µg/l in November with a mean of 7.5 µg/l. The potential for primary productivity as measured by algal assay control yields was high. Marked depression of dissolved oxygen occurred throughout the lake in the hypolimnion in November. Of the 10 Nevada lakes sampled in 1975, 6 had higher median total phosphorus levels (0.057 mg/l), 3 had higher median inorganic nitrogen values (0.165 mg/l), and 4 had higher median orthophosphorus levels (0.041 mg/l) than Topaz Lake.

Survey limnologists did not report any problem algal blooms or macrophytes on their visits to the lake.

*See Appendix E.

B. Rate-Limiting Nutrient:

Algal assay results indicate Topaz Lake was limited by available nitrogen. The mean inorganic nitrogen to orthophosphorus (N/P) ratios in the lake data of 7/1 or less on each sampling occasion also suggest primary limitation by nitrogen.

C. Nutrient Controllability:

1. Point sources -

There were no known point sources impacting Topaz Lake during the sampling year.

The present phosphorus loading of 1.36 g $P/m^2/yr$ is greater than that proposed by Vollenweider as "eutrophic". The Carson River Basin Council of Governments (1974) reports that agricultural return flow from irrigated areas is a major cause of water quality deterioration in the Walker River Basin. A closer examination of agricultural practices in the Topaz Lake drainage area may provide answers to nutrient reductions.

2. Nonpoint sources -

Unnamed Canal (B-1) contributed 97% of the total phosphorus load to the lake during the sampling year. Water for the canal is diverted from the Walker River; however, actual contributions from the canal may be somewhat less than indicated since it is not known how much water is removed from Unnamed Canal via the West Walker River.

It should be noted that estimations of annual nutrient loadings contributed by septic tanks around Topaz Lake may be substantially underestimated. Those U.S. Geological Survey (USGS) quadrangles used for determining the number of shoreline residences located within 100 meters of the lake were dated in the 1950's. Thus the present number of septic tanks in the area in not known; neither has it been ascertained if those outside the 100 meter unit (U.S. EPA, 1975) do contribute nutrients to the lake as has been suggested (F. Luchetti, personal communication). Additional study to obtain a more accurate picture of the nutrient budget for Topaz Lake is recommended.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

Lake and drainage basin characteristics are itemized below. Lake morphometry data were provided by James B. Williams, Jr. (personal communication). Tributary flow data were provided by the Nevada District Office of the U.S. Geological Survey. Outlet drainage area includes the lake surface area. The drainage area and flow of the Walker River is included in the drainage area of Topaz Canal (A-1) and Unnamed Canal (B-1). Mean hydraulic retention time was obtained by dividing the lake volume by mean flow of the outlet. Precipitation values are estimated by methods as outlined in National Eutrophication Survey (NES) Working Paper No. 175. A table of metric/English conversions is included as Appendix A.

A. Lake Morphometry:

1. Surface area: 9.71 km^2.
2. Mean depth: 15.8 meters.
3. Maximum depth: 28.0 meters.
4. Volume: 154.418 x 10^6 m^3.
5. Mean hydraulic retention time: 264 days.

B. Tributary and Outlet:
(See Appendix B for flow data)

1. Tributaries -

Name	Drainage area (km^2)	Mean Flow (m^3/sec)
B-1 Unnamed Canal	1,048.9	6.75
Minor tributaries and immediate drainage -	21.4	0.06
Total	1,070.3	6.81
2. Outlet - A-1 Topaz Canal	1,080.0	6.77

C. Precipitation:

1. Year of sampling: 26.0 cm.
2. Mean annual: 21.6 cm.

III. LAKE WATER QUALITY SUMMARY

Topaz Lake was sampled three times during the open-water season of 1975 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from two stations on the lake and from a number of depths at each station (see map, page v). During each visit, depth-integrated samples were collected from each station for chlorophyll a analysis and phytoplankton identification and enumeration. During the first and last visits, 18.9-liter depth-integrated samples were composited for algal assays. Maximum depths sampled were 25.9 meters at Station 01, and 23.8 meters at Station 02. For a more detailed explanation of NES methods, see NES Working Paper No. 175.

The results obtained are presented in full in Appendix C and are summarized in III-A for waters at the surface and at the maximum depth for each site. Results of the phytoplankton counts and chlorophyll a determinations are included in III-B. Results of the limiting nutrient study are presented in III-C.

PAZ RESERVOIR
TORET CODE 3206

PHYSICAL AND CHEMICAL CHARACTERISTICS

PARAMETER	N*	(3/19/75) S*** = 2 RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	N*	(7/ 1/75) S*** = 2 RANGE	MEDIAN	MAX DEPTH RANGE (METERS)	N*	(11/ 5/75) S*** = 2 RANGE	MEDIAN	MAX DEPTH RANGE (METERS)
TEMPERATURE (DEG CENT)												
0.-1.5 M DEPTH	4	5.0- 5.4	5.2	0.0- 1.5	4	12.9- 17.4	14.8	0.0- 1.5	4	12.3- 12.5	12.4	0.0- 1.5
MAX DEPTH**	2	4.8- 5.1	4.9	23.8- 24.4	2	7.2- 7.2	7.2	15.2- 25.9	2	11.4- 11.6	11.5	18.9- 21.0
DISSOLVED OXYGEN (MG/L)												
0.-1.5 M DEPTH	4	9.6- 10.0	9.7	0.0- 1.5	4	8.6- 8.8	8.7	0.0- 1.5	4	7.6- 8.2	7.7	0.0- 1.5
MAX DEPTH**	2	9.4- 9.6	9.5	23.8- 24.4	2	2.6- 6.0	4.3	15.2- 25.9	2	0.4- 0.6	0.5	18.9- 21.0
CONDUCTIVITY (UMHOS)												
0.-1.5 M DEPTH	4	99.- 101.	100.	0.0- 1.5	4	75.- 100.	87.	0.0- 1.5	4	97.- 101.	100.	0.0- 1.5
MAX DEPTH**	2	100.- 101.	101.	23.8- 24.4	2	112.- 145.	129.	15.2- 25.9	2	101.- 107.	104.	18.9- 21.0
PH (STANDARD UNITS)												
0.-1.5 M DEPTH	4	7.5- 7.9	7.8	0.0- 1.5	4	8.3- 8.8	8.5	0.0- 1.5	4	7.6- 7.8	7.7	0.0- 1.5
MAX DEPTH**	2	7.8- 7.9	7.8	23.8- 24.4	2	7.5- 8.0	7.8	15.2- 25.9	2	7.3- 7.5	7.4	18.9- 21.0
TOTAL ALKALINITY (MG/L)												
0.-1.5 M DEPTH	4	81.- 86.	84.	0.0- 1.5	4	47.- 53.	53.	0.0- 1.5	4	61.- 75.	69.	0.0- 1.5
MAX DEPTH**	2	83.- 88.	86.	23.8- 24.4	2	82.- 88.	85.	15.2- 25.9	2	60.- 71.	66.	18.9- 21.0
TOTAL P (MG/L)												
0.-1.5 M DEPTH	4	0.054-0.060	0.055	0.0- 1.5	4	0.036-0.068	0.043	0.0- 1.5	4	0.067-0.086	0.071	0.0- 1.5
MAX DEPTH**	2	0.054-0.060	0.057	23.8- 24.4	2	0.085-0.159	0.122	15.2- 25.9	2	0.096-0.173	0.134	18.9- 21.0
DISSOLVED ORTHO P (MG/L)												
0.-1.5 M DEPTH	4	0.041-0.042	0.041	0.0- 1.5	4	0.005-0.015	0.007	0.0- 1.5	4	0.037-0.049	0.045	0.0- 1.5
MAX DEPTH**	2	0.041-0.044	0.042	23.8- 24.4	2	0.059-0.118	0.088	15.2- 25.9	2	0.083-0.103	0.093	18.9- 21.0
NO2+NO3 (MG/L)												
0.-1.5 M DEPTH	4	0.040-0.040	0.040	0.0- 1.5	4	0.020-0.030	0.020	0.0- 1.5	4	0.020-0.020	0.020	0.0- 1.5
MAX DEPTH**	2	0.040-0.040	0.040	23.8- 24.4	2	0.030-0.050	0.040	15.2- 25.9	2	0.020-0.020	0.020	18.9- 21.0
AMMONIA (MG/L)												
0.-1.5 M DEPTH	4	0.220-0.230	0.220	0.0- 1.5	4	0.020-0.520	0.030	0.0- 1.5	4	0.040-0.080	0.065	0.0- 1.5
MAX DEPTH**	2	0.230-0.230	0.230	23.8- 24.4	2	0.190-0.420	0.305	15.2- 25.9	2	0.160-0.500	0.330	18.9- 21.0
KJELDAHL N (MG/L)												
0.-1.5 M DEPTH	4	0.600-1.200	0.650	0.0- 1.5	4	0.200-0.500	0.350	0.0- 1.5	4	0.200-0.200	0.200	0.0- 1.5
MAX DEPTH**	2	0.500-0.600	0.550	23.8- 24.4	2	0.400-0.800	0.600	15.2- 25.9	2	0.400-0.600	0.500	18.9- 21.0
SECCHI DISC (METE												
	2	3.4- 4.3	3.8		2	1.8- 2.4	2.1		2	3.4- 3.7	3.5	

* N = NO. OF SAMPLES
** MAXIMUM DEPTH SAMPLED AT EACH SITE
*** S = NO. OF SITES SAMPLED ON THIS DATE

B. Biological Characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units Per ml
03/19/75	1. Centric diatom	198
	2. Fragilaria	159
	3. Dictyosphaerium	119
	4. Melosira	119
	5. Chroomonas?	79
	Other genera	39
	Total	713
06/30/75	1. Fragilaria	5,059
	2. Asterionella	670
	3. Chroomonas?	335
	4. Aphanizomenon	274
	5. Cryptomonas	30
	Other genera	32
	Total	6,400
07/01/75	1. Fragilaria	4,766
	2. Aphanizomenon	801
	3. Asterionella	521
	4. Chroomonas?	320
	5. Melosira	160
	Other genera	80
	Total	6,648
11/05/75	1. Cryptomonas	224
	2. Fragilaria	112
	3. Staurastrum	112
	4. Melosira	56
	5. Stephanodiscus	19
	Other genera	37
	Total	560

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (µg/l)
03/19/75	01	3.2
	02	3.3
06/30/75	01	9.4
	02	8.5
11/05/75	01	9.6
	02	11.1

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum Yield (mg/l-dry wt.)
a. 03/19/75			
Control	0.035	0.208	6.4
0.05 P	0.085	0.208	7.5
0.05 P + 1.0 N	0.085	1.208	25.3
1.00 N	0.035	1.208	11.5
b. 11/05/75			
Control	0.055	0.180	8.3
0.05 P	0.105	0.180	8.4
0.05 P + 1.0 N	0.105	1.180	38.4
1.00 N	0.055	1.180	23.2

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum*, indicate that the potential for primary productivity in Topaz Lake was high during the sample collection times (03/19/75, 11/05/75). In both assays, a significant increase in yield over that of the control occurred when nitrogen was added alone and in combination with phosphorus, indicating nitrogen limitation. Spikes of phosphorus alone did not stimulate growth significantly beyond control yields.

The mean N/P ratios in the lake data were 7/1 or less on the three sampling occasions further suggesting primary limitation by nitrogen (a mean N/P ratio of 14/1 or less generally reflects phosphorus limitation).

*For further information regarding the algal assay test procedure and selection of test organisms, see U.S. EPA (1971).

IV. NUTRIENT LOADINGS
(See Appendix D for data)

For the determination of nutrient loadings, the Nevada National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of April, May, June and July when two samples were collected. Sampling was begun in November 1974, and was completed in November 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Nevada District Office of the USGS for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a USGS computer program for calculating stream loadings. Nutrient loads indicated for tributaries are those measured minus known point source loads, if any.

Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of USGS) were estimated by using the mean annual concentrations in Unnamed Canal, California Creek and Slinkard Creek at Stations B-1, C-1, and D-1 and mean annual ZZ flow.

A. Waste Sources:

1. Known municipal - None

2. Known industrial - None

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/yr	% of total
a. Tributaries (nonpoint load) -		
B-1 Unnamed Canal	12,825	97.3
b. Minor tributaries and immediate drainage (nonpoint load) -	185	1.4
c. Known municipal STP's - None		
d. Septic tanks* -	<5	<0.1
e. Known industrial - None		
f. Direct precipitation** -	170	1.3
Total	13,180	100.0%

2. Outputs - A-1 Topaz Canal 6,195

3. Net annual P accumulation - 6,985

*Estimate based on 1 lakeshore residence.
**Estimated (See NES Working Paper No. 175).

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (nonpoint load) -		
B-1 Unnamed Canal	114,020	90.6
b. Minor tributaries and immediate drainage (nonpoint load) -	1,355	1.1
c. Known municipal STP's - None		
d. Septic tanks* -	10	<0.1
e. Known industrial - None		
f. Direct precipitation** -	10,485	8.3
Total	125,870	100.0%

2. Outputs - A-1 Topaz Canal 195,470

3. Net annual N export*** - 69,600

*Estimate based on 1 lakeshore residence.
**Estimated (See NES Working Paper No. 175).
***Export probably due to unknown sources and/or sampling error.

D. Mean Annual Nonpoint Nutrient Export by Subdrainage Area:

Tributary	kg P/km^2/yr	kg N/km^2/yr
Unnamed Canal	12	109

E. Mean Nutrient Concentrations in Ungaged Streams:

Tributary	Mean Total P (mg/l)	Mean Total N (mg/l)
C-1 California Creek	0.115	0.900
D-1 Slinkard Creek	0.123	0.715

F. Yearly Loadings:

In the following table, the existing phosphorus annual loading is compared to the relationship proposed by Vollenweider (1975). Essentially, his "eutrophic" loading is that at which the receiving waters would become eutrophic or remain eutrophic; his "oligotrophic" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A "mesotrophic" loading would be considered one between "eutrophic" and "oligotrophic".

Note that Vollenweider's model may not apply to lakes with short hydraulic retention times or in which light penetration is severely restricted by high concentrations of suspended solids in the surface waters.

	Total Yearly Phosphorus Loading ($g/m^2/yr$)
Estimated loading for Topaz Lake	1.36
Vollenweider's "eutrophic" loading	0.90
Vollenweider's "oligotrophic" loading	0.45

V. LITERATURE REVIEWED

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VI. APPENDICES

APPENDIX A

CONVERSION FACTORS

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CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX B

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR NEVADA 1/21/77

LAKE CODE 3206 TOPAZ LAKE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 1080.0

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
3206A1	1080.0	0.93	1.42	2.01	7.02	16.99	21.04	15.01	8.64	4.73	1.84	0.62	0.68	6.77
320681	1048.9	3.42	4.98	3.94	5.52	17.78	23.70	10.51	2.35	1.10	1.47	2.66	3.34	6.75
3206ZZ	31.1	0.028	0.031	0.037	0.082	0.161	0.210	0.088	0.031	0.025	0.017	0.020	0.023	0.063

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 1080.0
SUM OF SUB-DRAINAGE AREAS = 1080.0
TOTAL FLOW IN = 81.74
TOTAL FLOW OUT = 80.93

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3206A1	11	74	0.850	15	0.906				
	12	74	0.793	16	0.793				
	1	75	0.736	20	0.765				
	2	75	0.680	18	0.623				
	3	75	0.708	19	0.708				
	4	75	0.765	4	0.736	22	0.765		
	5	75	11.327	7	7.079	21	25.485		
	6	75	28.317	2	31.149	30	22.653		
	7	75	19.822	3	22.653	16	18.406		
	8	75	14.158						
	9	75	5.663	22	5.663				
	10	75	2.832						
	11	75	0.0	3	2.265				
320681	11	74	2.832	15	2.888				
	12	74	2.690	16	2.662				
	1	75	2.690	20	2.662				
	2	75	2.549	18	2.407				
	3	75	2.832	19	3.030				
	4	75	3.115	4	3.058	22	3.256		
	5	75	16.990	7	8.495	21	31.149		
	6	75	39.644	2	45.307	30	28.317		
	7	75	16.990	3	25.485	16	19.822		
	8	75	2.832						
	9	75	3.681	22	4.248				
	10	75	4.248						
	11	75	0.0	3	5.663				

APPENDIX C

PHYSICAL AND CHEMICAL DATA

STORET RETRIEVAL DATE 77/01/26
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

320601
38 41 02.0 119 31 58.0 3
TOPAZ RESERVOIR
32005 NEVADA
150191

/TYPA/AMBNT/LAKE

11EPALES 04001002
0084 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/03/19	11 55	0000	5.4	9.8	132	101	7.50	86	0.230	1.200	0.040	0.041
	11 55	0005	5.4	10.0		100	7.65	84	0.220	0.600	0.040	0.041
	11 55	0025	5.3	9.4		101	7.70	85	0.220	0.600	0.040	0.041
	11 55	0050	5.2	10.0		99	7.80	83	0.210	0.600	0.040	0.040
	11 55	0080	5.1	9.6		100	7.80	83	0.230	0.500	0.040	0.041
75/07/01	09 50	0000	17.4	8.6	72	100	8.80	53	0.030	0.400	0.020K	0.005
	09 50	0005	16.6	8.6		99	8.80	53	0.520	0.300	0.020K	0.008
	09 50	0015	14.5	8.0		91	8.40	53	0.020	0.300	0.020K	0.008
	09 50	0025	12.9	7.4		91	8.00	55	0.040	0.300	0.020	0.015
	09 50	0040	10.4	7.0		100	7.80	64	0.100	0.400	0.050	0.038
	09 50	0065	7.7	4.6		142	7.60	87	0.290	0.600	0.050	0.079
	09 50	0085	7.2	2.6		145	7.50	88	0.420	0.800	0.030	0.118
75/11/05	15 00	0000	12.5	8.2	144	101	7.70	74	0.040	0.200	0.020K	0.037
	15 00	0005	12.4	7.6		101	7.80	75	0.050	0.200	0.020K	0.043
	15 00	0025	12.2	7.8		99	7.65	73	0.060	0.200	0.020K	0.049
	15 00	0045	12.2	5.8		99	7.60	78	0.080	0.200	0.020K	0.050
	15 00	0069	11.4	0.4		107	7.30	71	0.500	0.600	0.020K	0.103

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/03/19	11 55	0000	0.060	3.2	
	11 55	0005	0.057		
	11 55	0025	0.056		
	11 55	0050	0.054		
	11 55	0080	0.054		
75/07/01	09 50	0000	0.036	9.4	
	09 50	0005	0.068		
	09 50	0015	0.036		
	09 50	0025	0.042		
	09 50	0040	0.050		
	09 50	0065	0.095		
	09 50	0085	0.159		
75/11/05	15 00	0000	0.071	9.6	
	15 00	0005	0.067		
	15 00	0025	0.058		
	15 00	0045	0.066		
	15 00	0069	0.173		

K VALUE KNOWN TO BE LESS THAN INDICATED

STORET RETRIEVAL DATE 77/01/26
NATL EUTROPHICATION SURVEY
EPA-LAS VEGAS

320602
38 40 18.0 119 32 17.0 3
TOPAZ RESERVOIR
32005 NEVADA

150191

/TYPA/AMBNT/LAKE

11EPALES 04001002
0082 FEET DEPTH CLASS 00

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
75/03/19	12 30	0000	5.0	9.6	168	99	7.90	84	0.220	0.700	0.040	0.042
	12 30	0005	5.0	9.6		99	7.90	81	0.220	0.600	0.040	0.041
	12 30	0019	5.0	9.4		100	7.90	81	0.220	0.600	0.040	0.042
	12 30	0050	4.9	9.8		99	8.00	83	0.220	0.600	0.040	0.044
	12 30	0078	4.8	9.4		101	7.90	88	0.230	0.600	0.040	0.044
75/06/30	14 20	0000	13.1	8.8	96	75	8.30	47	0.020	0.500	0.020K	0.007
	14 20	0005	12.9	8.8		75	8.30	53	0.030	0.200	0.030	0.015
	14 20	0015	12.9	7.6		79	7.90	54	0.060	0.200	0.020	0.020
	14 20	0035	10.4	7.4		77	7.70	60	0.080	0.300	0.030	0.025
	14 20	0050	7.2	6.0		112	8.00	82	0.190	0.400	0.050	0.059
75/11/05	15 25	0000	12.5	7.6	132	97	7.60	63	0.080	0.200	0.020	0.049
	15 25	0005	12.3	7.8		99	7.70	61	0.080	0.200	0.020	0.048
	15 25	0022	12.2	7.8		97	7.60	61	0.080	0.200	0.020	0.047
	15 25	0045	12.1	4.2		99	7.50	59	0.120	0.200	0.020	0.053
	15 25	0062	11.6	0.6		101	7.50	60	0.160	0.400	0.020	0.083

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
75/03/19	12 30	0000	0.054	3.3	
	12 30	0005	0.054		
	12 30	0019	0.056		
	12 30	0050	0.053		
	12 30	0078	0.060		
75/06/30	14 20	0000	0.038	8.5	
	14 20	0005	0.049		
	14 20	0015	0.050		
	14 20	0035	0.047		
	14 20	0050	0.085		
75/11/05	15 25	0000	0.086	11.1	
	15 25	0005	0.071		
	15 25	0022	0.082		
	15 25	0045	0.071		
	15 25	0062	0.096		

K VALUE KNOWN TO BE LESS THAN INDICATED

APPENDIX D

TRIBUTARY AND WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 77/01/22
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3206A1
38 41 45.0 119 30 20.0 4
Topaz Canal
32 15 TOPAZ LAKE
O/TOPAZ LAKE 150191
RNK SAMP OFF SEC RD 3 M E OF JCT HWY 395
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/15	10	15	0.016	0.700	0.155	0.040	0.060
74/12/16	08	30	0.032	0.700	0.144	0.040	0.060
75/01/20	10	40	0.032	0.500	0.136	0.035	0.070
75/02/18	11	05	0.035	1.750	0.460	0.040	0.065
75/03/19	13	05	0.050	0.950	0.145	0.035	0.060
75/04/04	11	45	0.050	1.050	0.105	0.030	0.030
75/04/22	10	30	0.005	1.000	0.020	0.015	0.030
75/05/07	10	10	0.015	0.500	0.050	0.015	0.015
75/05/21	10	30	0.025	1.450	0.075	0.025	0.040
75/06/02	18	45	0.015	0.200	0.005	0.010	0.020
75/06/30	10	45	0.005	1.000	0.015	0.010	0.030
75/07/03	11	00	0.010	0.450	0.010	0.010	0.015
75/07/16	10	50	0.015	1.150	0.020	0.010	0.020
75/09/22	11	00	0.005	0.300	0.015	0.005K	0.040
75/11/03	14	50	0.025	0.700	0.035	0.040	0.050

K VALUE KNOWN TO BE LESS
THAN INDICATED

NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3206H1
38 38 10.0 119 30 25.0 4
Unnamed Canal
32 15 TOPAZ LAKE
T/TOPAZ LAKE 150191
UNMPRVD RD BRDG 1.7 MI S OF TOPAZ PO
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/15	12 30		0.016	0.100	0.020	0.020	0.030
74/12/16	09 30		0.056	0.100K	0.056	0.024	0.030
75/01/20	11 45		0.092	0.500	0.096	0.030	0.040
75/02/18	11 55		0.070	0.950	0.070	0.020	0.050
75/03/19	14 15		0.025	0.350	0.095	0.025	0.070
75/04/04	13 30		0.042	0.750	0.015	0.022	0.030
75/04/22	11 30		0.015	0.300	0.015	0.020	0.060
75/05/07	10 50		0.025	1.000	0.020	0.045	0.090
75/05/21	11 00		0.085	0.900	0.030	0.025	0.080
75/06/02	11 30		0.055	0.250	0.015	0.020	0.130
75/06/30	11 20		0.010	0.650	0.015	0.020	0.080
75/07/03	11 30		0.010	0.300	0.015	0.025	0.030
75/07/16	11 30		0.005	0.200	0.010	0.015	0.040
75/09/22	11 50		0.030	0.475	0.010	0.045	0.100
75/11/03	15 46		0.025	0.200	0.010	0.025	0.040

STORET RETRIEVAL DATE 77/01/22
NATL EUTROPHICATION SURVEY
EPA- LAS VEGAS

3206C1
38 40 50.0 119 32 50.0 4
CALIFORNIA CREEK
32 15 TOPAZ LAKE
T/TOPAZ LAKE 150191
US HWY 395 BRDG .5 M S OF CA NV STATE LN
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/15	10 45		0.008	0.600	0.025	0.010	0.080
74/12/16	09 00		0.104	0.100	0.024	0.016	0.040
75/01/20	11 00		0.160	0.600	0.016	0.020	0.070
75/02/18	11 25		0.185	1.600	0.035	0.020	0.100
75/03/19	13 25		0.125	1.150	0.075	0.020	0.140
75/04/04	12 30		0.140	0.950	0.005K	0.020	0.020
75/04/22	11 00		0.105	0.500	0.015	0.025	0.110
75/05/07	10 30		0.070	0.400	0.035	0.050	0.090
75/05/21	10 45		0.085	1.250	0.025	0.025	0.130
75/06/02	11 00		0.090	0.950	0.020	0.035	0.210
75/06/30	11 00		0.035	1.100	0.020	0.030	0.140
75/07/03	11 05		0.015	0.750	0.020	0.025	0.110
75/07/16	11 05		0.025	0.675	0.010	0.030	0.120
75/09/22	11 20		0.025	1.100	0.005K	0.025	0.250
75/11/03	15 05		0.005	0.600	0.005	0.015	0.120

K VALUE KNOWN TO BE LESS THAN INDICATED

NATL EUTHOPHICATION SURVEY
EPA- LAS VEGAS

320601
38 38 30.0 119 31 50.0 4
SLINKARD CREEK
32 15 TOPAZ LAKE
T/TOPAZ LAKE 150191
BNK SAM ON HWY 89 .1 MI W OF HWY 395 JCT
11EPALES 04001004
0000 FEET DEPTH CLASS 00

/TYPA/AMBNT/STREAM

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/11/15	11	15	0.004	0.200	0.050	0.070	0.085
74/12/16	09	15	0.048	0.200	0.016	0.080	0.080
75/01/20	11	20	0.112	0.100	0.008K	0.065	0.080
75/02/18	11	40	0.100	1.450	0.260	0.065	0.120
75/03/19	13	15	0.050	0.200	0.020	0.065	0.110
75/04/04	13	05	0.190	1.650	0.015	0.075	0.080
75/04/22	11	10	0.075	0.600	0.010	0.060	0.110
75/05/07	10	40	0.045	0.800	0.065	0.065	0.100
75/05/21	10	50	0.070	2.500	0.030	0.080	0.230
75/06/02	11	15	0.040	0.150	0.025	0.105	0.110
75/06/30	11	10	0.010	0.550	0.010	0.140	0.155
75/07/03	11	10	0.015	0.450	0.025	0.130	0.140
75/07/16	11	15	0.015	0.350	0.015	0.160	0.200
75/09/22	11	30	0.005	0.400	0.010	0.110	0.130
75/11/03	15	25	0.005	0.300	0.005K	0.090	0.110

K VALUE KNOWN TO BE LESS
THAN INDICATED

APPENDIX E

PARAMETRIC RANKINGS OF LAKES
SAMPLED BY NES IN 1975

STATE OF NEVADA

Mean or median values for six of the key parameters evaluated in establishing the trophic conditions of Nevada lakes sampled are presented to allow direct comparison of the ranking, by parameter, of each lake relative to the others. Median total phosphorus, median inorganic nitrogen and median dissolved orthophosphorus levels are expressed in mg/l. Chlorophyll a values are expressed in µg/l. To maintain consistent rank order with the preceding parameters, the mean Secchi disc depth, in inches, is subtracted from 500. Similarly, minimum dissolved oxygen values are subtracted from 15 to create table entries.

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
3201	LAKE MEAD	0.016	0.340	266.565	3.111	11.400	0.005
3202	LAHONTAN RESERVOIR	0.198	0.350	472.083	4.608	10.400	0.148
3204	RYE PATCH RESERVOIR	0.094	0.050	467.750	4.938	10.000	0.039
3205	LAKE TAHOE	0.005	0.040	-3.269	0.571	10.200	0.003
3206	TOPAZ RESERVOIR	0.057	0.165	376.000	7.517	14.600	0.041
3207	UPPER PAHRANGAT LAKE	0.173	0.125	470.000	---	8.600	0.026
3208	WASHOE LAKE	0.403	0.130	494.555	11.633	7.200	0.268
3209	WILD HORSE RESERVOIR	0.114	0.320	439.400	75.530	14.600	0.065
3210	WILSON RESERVOIR	0.049	0.120	197.333	10.033	11.400	0.016
3211	WALKER LAKE	0.602	0.080	405.333	3.422	15.000	0.574

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
3201	LAKE MEAD	89 (8)	11 (1)	78 (7)	88 (7)	39 (3)	89 (8)
3202	LAHONTAN RESERVOIR	22 (2)	0 (0)	22 (2)	63 (5)	56 (5)	22 (2)
3204	RYE PATCH RESERVOIR	56 (5)	89 (8)	44 (4)	50 (4)	78 (7)	56 (5)
3205	LAKE TAHOE	100 (9)	100 (9)	100 (9)	100 (8)	67 (6)	100 (9)
3206	TOPAZ RESERVOIR	67 (6)	33 (3)	67 (6)	38 (3)	17 (1)	44 (4)
3207	UPPER PAHRANAGAT LAKE	33 (3)	56 (5)	33 (3)	---	89 (8)	67 (6)
3208	WASHOE LAKE	11 (1)	44 (4)	0 (0)	13 (1)	100 (9)	11 (1)
3209	WILD HORSE RESERVOIR	44 (4)	22 (2)	11 (1)	0 (0)	17 (1)	33 (3)
3210	WILSON RESERVOIR	78 (7)	67 (6)	89 (8)	25 (2)	39 (3)	78 (7)
3211	WALKER LAKE	0 (0)	78 (7)	56 (5)	75 (6)	0 (0)	0 (0)